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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/537,591	06/06/2005	Theodoor Gertrudis Silvester Maria Rijks	EPC-016	6387

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EXAMINER	
THOMAS, LUCY M	

ART UNIT	PAPER NUMBER
2836	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/537,591	RIJKS ET AL.
	Examiner	Art Unit
	Lucy Thomas	2836

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 June 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *7/02/2008,7/10/2008*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the element "a transistor" of Claim 5 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-4, 6-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Zavracky et al. (US 4,674,180). Regarding Claim 1, Zavracky discloses an electronic device (Figures 1-8, 10-13) comprising: an array (array of 121, 122, 123) of micro-electromechanical system (MEMS) elements 10 including at least first and second MEMS elements (see for example, MEMS elements 10 of 121, 122 in Figure 8), said array being connected by an input and an output (input and output through communication bus 127, 128) and providing a plurality of states at its output F1, F2,

wherein each of the first and second MEMS elements has a characteristic hysteresis curve, a first state and a second state (see MEMS 10 having closed and open states drawn with hysteresis curve in Figures 7-8, 11, also see Column 3, lines 46-48, Column 5, line 64 – Column 6, line 1), and

wherein a transition from the first to the second state is effected by an opening voltage, and a transition from the second to the first state is effected by a closing voltage (characteristic of an element having hysteresis), the opening voltage and closing voltage of the first MEMS element being different from the opening voltage and

closing voltage of the second MEMS element (each MEMS having different hysteresis curve, have different opening and closing voltages), and

wherein the input is adapted for applying a single control voltage that is to be applied to all the MEMS elements whereby the various states of the array are to be obtained by varying the single control voltage (single input voltage is applied to all MEMS elements 10 in Figures 8, 11, through communication bus 127,128).

Regarding Claim 2, Zavracky discloses that the array includes at least three MEMS elements (see for example, MEMS elements 10 of 121, 122, 123 in Figure 8) each having a characteristic hysteresis curve, such that the opening voltage is different from the closing voltage, which characteristic hysteresis curves and the corresponding opening and closing voltages differ from one MEMS element to another MEMS element.

Regarding Claims 3-4, Zavracky discloses that the MEMS elements in the array are connected in parallel (see MEMS elements 10 of 121 to 123 arranged in parallel), wherein the number of MEMS elements in the array is in the range from 2 to 10.

Regarding Claim 6, Zavracky discloses a plurality of arrays of MEMS elements, each array having an input for a single control voltage (array 121-123 and array 124-126 has a single control voltage through 127, 128).

Regarding Claim 7, Zavracky discloses that each of the MEMS elements in the array has a fixed electrode and a movable electrode that is movable towards and away from the fixed electrode by application of the closing and the opening voltage respectively, such that in the first state the distance between the fixed and the movable electrode is smaller than in the second state, which movable electrode is suspended

substantially parallel to the fixed electrode and anchored to a support structure by at least one cantilever arm having a spring constant, which MEMS element is provided with an actuation electrode with an actuation area for provision of the closing and opening voltages.

Regarding Claim 8, Zavracky discloses that the first and second MEMS elements in the array have different characteristic hysteresis curves in that actuation areas of control electrodes of the first and second MEMS elements are different and/or spring constants of cantilever arms are different.

Regarding Claim 9, Zavracky discloses that at least one dielectric layer having a dielectric permittivity is present between the fixed and the movable electrode, such that the MEMS element is a MEMS capacitor, of which capacitor the first state has a first state capacitance, and a first and a second MEMS capacitor in the array have different characteristic hysteresis curves in that the first state capacitances of the first and the second MEMS capacitor are different.

Regarding Claim 10, Zavracky discloses that the characteristic hysteresis curves differing from the first MEMS element to the second MEMS element are designed such that the hysteresis curve having a smaller width is located fully within the width of the hysteresis curve having the larger width (Column 7, lines 40-44).

Regarding Claim 11, Zavracky discloses that the characteristic hysteresis curves of the first and second MEMS elements are centered around a common centerline in the operational diagram (selecting hysteresis curves to get different logic state with single voltage sweep, see 46-53).

Regarding Claim 12, Zavracky discloses a method of driving an array of micro-mechanical system (MEMS) elements according to Claim 1, wherein a single control voltage is applied in common to the MEMS elements in the array, which voltage is varied to obtain the various states of the array (see input to MEMS elements 10 of the array through communication bus 127, 128).

Regarding Claim 13, Zavracky discloses an electronic device (Figures 1-8, 10-13) comprising:

a first MEMS element (MEMS element 10 of 121) having a first characteristic hysteresis curve and a first state and a second state, a transition from the first to the second state being effected by a first opening voltage, and a transition from the second to the first state being effected by a first closing voltage (see MEMS 10 having closed and open states drawn with hysteresis curve in Figures 7-8, 11, also see Column 3, lines 46-48, Column 5, line 64 – Column 6, line 1);

a second MEMS element (MEMS element 10 of 122) having a second characteristic hysteresis curve that is different than the first characteristic hysteresis curve, the second MEMS element also having a first state and a second state wherein a transition from the first to the second state is effected by a second opening voltage, and a transition from the second to the first state is effected by a second closing voltage, the second opening voltage being different than a first opening voltage and the second closing voltage being different than the first closing voltage (see MEMS 10 having closed and open states drawn with hysteresis curve in Figures 7-8, 11, also see Column 3, lines 46-48, Column 5, line 64 – Column 6, line 1);

and a single common input (see input to MEMS elements 10 of the array through communication bus 127, 128) coupled to both the first MEMS element and the second MEMS element, wherein state transitions within the first MEMS element and within the second MEMS element are only effected by a control voltage applied to the single common input (MEMS elements are connected in parallel and therefore, the single control voltage is applied to each MEMS elements).

Regarding Claims 14-17, Zavracky discloses the first and second MEMS elements each include a fixed electrode 102 and a movable electrode 105 that is movable towards and away from the fixed electrode by application of the control voltage applied to the single common input,

wherein the distance between the fixed and the movable electrode is smaller in the first state (closed) than in the second state (open) (see Figures 1-4),

wherein the movable electrode is suspended substantially parallel to the fixed electrode and anchored to a support structure (one end of 105 connected to 100) by at least one cantilever arm having a spring constant (one end of 105 connected to 100), each MEMS element further having an actuation electrode 100 with an actuation area for providing the closing and opening voltages,

wherein the first and second MEMS elements each include a dielectric layer having a dielectric permittivity between the fixed and the movable electrode, such that each MEMS element is a MEMS capacitor (see Column 5, lines 61-63).

Regarding Claims 18-20, Zavracky discloses the first MEMS element comprises a first MEMS capacitor and wherein the second MEMS element comprises a second

MEMS capacitor such that the electronic device comprises a variable capacitor (see Figure 2, Column 5, lines 39-44),

wherein application of the control voltage to the single common input can cause the variable capacitor to take on at least four different capacitance values (each MEMS elements having two states, open and closed, results in four states or capacitance values),

further comprising at least one further MEMS element (MEMS element 10 of 123) coupled to the single common input, wherein application of the control voltage to the single common input can cause the variable capacitor to take on more than four different capacitance values (3 MEMS elements each having 2 states results in more than four different states or capacitance values).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-4, 6-9, 12-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over by Miles et al. (US 2004/0058532) (Miles '532) in view of Sugahara et al. (US 6,618,034). Regarding Claim 1, Miles '532 discloses an electronic device comprising an array of micro-electromechanical system (MEMS) elements 10 (Figures 1-9, Paragraph 20) including at least first and second MEMS elements (MEMS

elements/IMOD devices 10 are fabricated in large arrays as recited in Paragraph 20), said array being connected by an input and an output and providing a plurality of states at its output (each MEMS element of the array having characteristic response results in plurality of states at the output), wherein each of first and second the MEMS elements has a characteristic hysteresis curve, a first state and a second state (displaced/driven and undisplaced/undriven state), and wherein a transition from the first to the second state is effected by an opening voltage Vrelease, and a transition from the second to the first state is effected by a closing voltage Vactuation, the opening voltage and closing voltage of the first MEMS element being different from the opening voltage and closing voltage of the second MEMS element (see Figures 5, 7, Paragraphs 22, 28-29), and wherein the input is adapted for applying a control voltage Vbias that is to be applied to all the MEMS elements whereby the various states of the array are to be obtained by varying the single control voltage (see Paragraph 22).

Miles does not specifically disclose that the control voltage applied to all the MEMS is a single control voltage. Sugahara discloses an electronic device comprising an array of MEMS elements (see Figure 11) where a single control voltage is applied to all the MEMS elements (see a single voltage V1 is applied to top array, V2 to the next array). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a single control voltage to drive the MEMS elements of Miles, because Sugahara teaches the use of a single control voltage to drive all the MEMS elements in an array and teaches that using only a single control voltage would

reduce the number ICs required and results in a simple drive circuit (see Sugahara, C0lumn 1, lines 12-35).

Regarding Claim 2, Miles '532 discloses that the array includes at least three MEMS elements (10 is large array and has at least three MEMS elements) having a characteristic hysteresis curve, such that the opening voltage is different from the closing voltage, which characteristic hysteresis curves and the corresponding opening and closing voltages differ from one MEMS element to another MEMS element (see Figures 5, 7, Paragraphs 22, 28-29).

Regarding Claim 2-4, 6, Sugahara teaches the MEMS array elements ranging from 2-10, connected in parallel, comprising plurality of arrays of MEMS elements, each array having an input for a single control voltage (see Figures10-11).

Regarding Claim 7, Miles '532 discloses that each of the MEMS elements in the array has a fixed electrode 12 and a movable electrode 14 that is movable towards and away from the fixed electrode by application of the closing and the opening voltage respectively, such that in the first state (displaced state) the distance between the fixed and the movable electrode is smaller than in the second state (undisplaced state), which movable electrode is suspended substantially parallel to the fixed electrode (see Figures 1-2) anchored to a support structure 18 by at least one cantilever arm having a spring constant (see arms of 14 with one end on 18 in Figure 2), which MEMS element is provided with an actuation electrode 20 with an actuation area for provision of the closing and opening voltages (Paragraph 19).

Regarding Claim 8, Miles '532 discloses that the first and second MEMS elements in the array have different characteristic hysteresis curves in that actuation areas of control electrodes of the first and second MEMS elements are different (see Paragraph 22, different layer thickness results in different cross sectional area of the electrode).

Regarding Claim 9, Miles '532 discloses that at least one dielectric layer Al203 having a dielectric permittivity is present between the fixed and the movable electrode, such that the MEMS element is a MEMS capacitor, of which capacitor the first state has a first state capacitance, and a first and a second MEMS capacitor in the array have different characteristic hysteresis curves in that the first state capacitances of the first and the second MEMS capacitor are different (see Paragraphs 22, 28-29, Figures 5, 7, reflectance shown on Y-axis varies due to change in capacitance/charge trapping).

Regarding Claim 12, Miles '532 discloses a method for driving 22 an array of micromechanical system (MEMS) elements of Claim 1, wherein a control voltage is applied in common to the MEMS elements in the array, which voltage is varied to obtain the various states of the array (see Figures 1-2, drive mechanism 22 apply control voltage to electrode 20).

Regarding Claims 10-11, Miles and Sugahara disclose that the characteristic hysteresis curves differing from one MEMS element to another MEMS element by their individual width (see Miles, paragraph 22, Sugahara, Figure 10). Miles and Sugahara do not specifically disclose that the MEMS elements are designed such that the hysteresis curve having a smaller width is located fully within the width of the hysteresis curve

having the next- larger width (Claim 10), and that the curves of the MEMS elements are centered around a common centerline in the operational region. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the combination of Miles '532 and Sugahara, and to design the MEMS elements, to have the smaller width elements fully located within the width of the next-larger width, and to have offset voltage to center the curves, because Miles teaches that the width variations can be caused by several factors, such as thickness of the layers, and resistance variations of the lines (see paragraph 22, lines 11-18).

Claims 13-16 basically recites the elements of Claims 1 and 7-9, except that the first MEMS element and characteristics and the second MEMS element characteristics are recited. Therefore, please see the rejections for Claims 1 and 7-9 recited above. Regarding Claims 17-20, both Miles and Sugahara disclose MEMS capacitors with the recited characteristics.

6. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zavracky et al. (US 4,674,180) in view of Miles (US 6,674,562) (Miles '562) or alternatively Miles et al. (US 2004/0058532) (Miles '532) in view of Sugahara et al. (US 6,618,034) and Miles (US 6,674,562) (Miles '562). Regarding Claim 5, Zavracky or Miles '532 and Sugahara do not disclose that the input for a single control voltage is from a transistor. Miles '562 discloses an MEMS device 410 (see Figure 4C) where the input for a single control voltage is from a transistor (see transistors 404 output given to 410). It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device of Zavracky/Miles '532 and Sugahara, and to include a transistor as

taught by Miles 562, as a means to provide variable voltage levels for the single control voltage.

Response to Arguments

7. Applicant's arguments filed 6/16/2008 have been fully considered, but are rendered moot in view of new grounds of rejection.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lucy Thomas whose telephone number is 571-272-6002. The examiner can normally be reached on Monday - Friday 8:00 AM - 4:30 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Sherry can be reached on 571-272-2084. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Michael J Sherry/
Supervisory Patent Examiner, Art Unit 2836

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Examiner, Art Unit 2836
September 18, 2008